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Report on Patentability and Annexes
(in English)**

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Consequently, no inventive step underlies the subject matter of claim 1.

- 3.1 The remaining claims do not contain any features which satisfy the requirements of the PCT with respect to novelty or inventive step in combination with the features of any claim to which they relate.

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elements such that the internal formwork and the external formwork cannot move apart on the pouring in of concrete. To prevent such a movement, a formwork tie is formed by a bolt element and two locking elements, with the latter, as already mentioned, being suitable for the transmission of tensile forces from the formwork elements onto the bolt element.

~~The fact is disadvantageous with the known formwork systems that the previously used formwork ties are, as a rule, not able to prevent~~ Formwork systems are furthermore known in which formwork elements of the internal formwork and of the external formwork are prevented from moving toward one another due to a corresponding force action, in particular on the pouring in of concrete, so that a wall ultimately to be produced does would not have the desired thickness in all regions after completion.

Formwork ties are thus described in AP 100 A, GB 2 057 042 A, US 913,538, US 3,167,842, US 2,584,822, DE 24 08 558 and DE 103 36 414 A1 which can absorb both tensile forces and compressive forces and can thus hold the formwork elements at a specific spacing from one another. Furthermore, formwork elements can be held at a fixed spacing by separate spacers, as is described in DE 197 54 366 A1.

It is disadvantageous with the known formwork systems that the formwork ties required at a fixed spacing from one another for the fixing of framework elements have to be assembled from a plurality of individual elements or additionally spacers have to be positioned with respect to the formwork ties, whereby the time and personnel effort for the assembly increases.

An object of the invention consists of further developing a formwork system of the initially named kind, wherein ~~such that~~ it is reliably prevented that the internal formwork and the external formwork move toward one another, in particular on the pouring in of concrete, such that the formwork ties only have to be assembled from a minimum number of elements to be coupled during the erection of the formwork.

The said object is satisfied in accordance with the invention by the features of claim 1 and in particular in that a formwork system of the initially named kind, which comprises a formwork tie consisting of a bolt element and two locking elements which can be coupled to the formwork elements, is made such that the locking elements of the formwork ties have coupling elements for the transmission of compressive forces from the formwork elements onto the bolt element that the one locking element is captively connected to the bolt element and the other locking element is releasably connectable to the bolt element.

Due to the provision of these coupling elements in accordance with the invention, the locking elements are furthermore – as also in the prior art – not only suitable for the transmission of tensile forces, but also for the transfer of compressive forces from the formwork elements onto the bolt ele-

ment. In this manner, the spacing set in a defined manner by the formwork ties in accordance with the invention between the mutually facing inner surfaces of the formwork of the internal formwork and of the external formwork is fixed in both directions so that this spacing can neither increase nor decrease on the filling with concrete or on the action of any other forces. It is thus ensured that the concrete walls to be erected have the desired thickness preset by the formwork ties in all regions.

It is furthermore now achieved in accordance with the invention that the fitter only has to handle two parts per formwork tie, namely the bolt element captively connected to the one locking element and the other locking element. For the fitting, the locking element captively connected to the bolt element can be taken up and the bolt element inserted through the tie holes of the internal formwork and of the external formwork. Subsequently, the other locking element can be fastened at the end of the bolt element disposed opposite the said locking element.

The mutually oppositely disposed inner surfaces of the internal formwork and of the external formwork are preferably each formed by a group of individual formwork elements. In this connection, each group of formwork elements has tie holes, in particular circular tie holes, for the reception of the bolt elements of the formwork ties. These tie holes can be provided, for example, in the region of the connection sites of adjacent, mutually adjoining formwork elements so that each formwork element has semi-circular half-holes for ties, for example, in its marginal regions which, together with semi-circular tie holes of an adjacent formwork element, form complete tie holes.

The locking elements can each have a tensile force transmission surface cooperating with the respective outer side of the formwork elements. In this manner, a simple transmission of tensile force can be achieved from the formwork elements to the locking elements in that the locking elements are each positioned at the outer sides of the formwork elements such that their tensile force transmission surfaces contact the said outer sides areally. In this case, the regions of the outer sides of the formwork elements surrounding the tie holes must then be made to cooperate with

transmission of compressive forces from the formwork elements onto the bolt element.

The locking elements preferably have a substantially parallelepiped-shaped housing to which the coupling element is shaped. This parallelepiped-shaped housing, including the coupling element, can be manufactured, for example, by means of an extrusion method or a rolling or roller method as bulk material from which the individual housings can then be cut off in the desired length. The housings manufactured in the said manner are then open at two mutually opposite sides in the cutting regions.

~~It is preferred for the one locking element to be captively connected to the bolt element, while the other locking element can be releasably connected to the bolt element. It is thereby achieved that the fitter only has to handle two parts per formwork tie, namely the bolt element captively connected to the one locking element and the other locking element. For the fitting, the locking element captively connected to the bolt element can be taken up and the bolt element inserted through the tie holes of the internal formwork and of the external formwork. Subsequently, the other locking element can be fastened at the end of the bolt element disposed opposite the said locking element.~~

It is particularly advantageous for the bolt element to be rotatably journaled around its longitudinal axis in the locking element fixedly connected to it. In this connection, the bolt element can project out of the locking element fixedly connected to it or out of the housing on the side remote from the tensile force transmission surface. A contact surface for a tool is then preferably provided in this projecting region. This projecting

Claims

1. A formwork system comprising formwork elements (16, 17) which have mutually oppositely disposed formwork inner surfaces (19, 20) and can be connected to one another spaced apart from one another by means of formwork ties, wherein a formwork tie consists of a bolt element (1) and two locking elements (2, 3) which, in the two mutually remote end regions of the bolt element (1), can be coupled to it and are formed for the transmission of tensile forces from the formwork elements (16, 17) onto the bolt element (1) and have coupling elements (9, 10) for the transmission of compressive forces from the formwork elements (16, 17) onto the bolt element (1),
characterized in that
the one locking element (2) is captively connected to the bolt element (1) and the other locking element (3) is releasably connectable to the bolt element (1).

~~109.~~ A formwork system in accordance with ~~claim 9~~ any one of the preceding claims, characterized in that the bolt element (1) is rotatably journaled around its longitudinal axis in the locking element (2) fixedly connected to it.

~~110.~~ A formwork system in accordance with any one of the preceding claims 9 or 10, characterized in that the bolt element (1) projects on the side remote from the tensile force transmission surface (21, 22) out of the locking element (2) fixedly connected to it and is provided

in this projecting region with a contact surface (11) for a tool, in particular with a square or a hexagon.

1211. A formwork system in accordance with any one of the preceding claims ~~9 to 11~~, characterized in that the bolt element (1) is provided at its end region remote from the locking element (2) fixedly connected to it with a thread for screwing into the locking element (3) releasable from the bolt element (1).

1312. A formwork system in accordance with any one of the preceding claims, characterized in that the bolt element (1) is conical.

1413. A formwork system in accordance with claim 1312, characterized in that the thread in accordance with claim ~~12-11~~ is provided at the thinner end region of the conically formed bolt element (1).

1514. A formwork system in accordance with any one of the preceding claims ~~9 to 14~~, characterized in that the locking element (3) releasable from the bolt element (1) is provided with a thread sleeve (12) into which the bolt element (1) can be screwed, with the external diameter of the thread sleeve (12) being dimensioned approximately like the internal diameter of the tie holes (18) formed in the formwork elements (16, 17).

1615. A formwork system in accordance with claim 1454, characterized in that the length of the section of the thread sleeve (12) projecting out of the locking element (3) is dimensioned such that it extends at least over the total thickness of a formwork element (17) cooperating with

the locking element (3).

~~17~~16. A formwork system in accordance with any one of the claims ~~15-14~~ or ~~16~~15, characterized in that the thread sleeve (12) is captively connected to the locking element (3) associated with it.

~~18~~17. A formwork system in accordance with any one of the preceding claims, characterized in that a locking block (6, 7) is held in the housing (4, 5) in accordance with claim 7 and is releasably connectable or fixedly connected to the bolt element (1).

~~19~~18. A formwork system in accordance with claim ~~18~~17, characterized in that the locking block (7) of the one locking element (3) is fixedly connected to the thread sleeve (2) in accordance with any one of the claims 15 to 17, whereas the bolt element (1) is rotatably journaled around its longitudinal axis in the other locking block (6).

~~20~~19. A formwork system in accordance with any one of the preceding claims, characterized in that the housing (4, 5) in accordance with claim 7 is provided with mutually aligned bolt holes (13, 14) at mutually oppositely disposed sides.

~~21~~20. A formwork system in accordance with claim ~~20~~19, characterized in that the bolt holes (13, 14) each have the shape of a curved elongate hole in which the bolt element (1) and/or the thread sleeve (12) in accordance with any one of the claims ~~15-14~~ to ~~17-16~~ are displaceable.